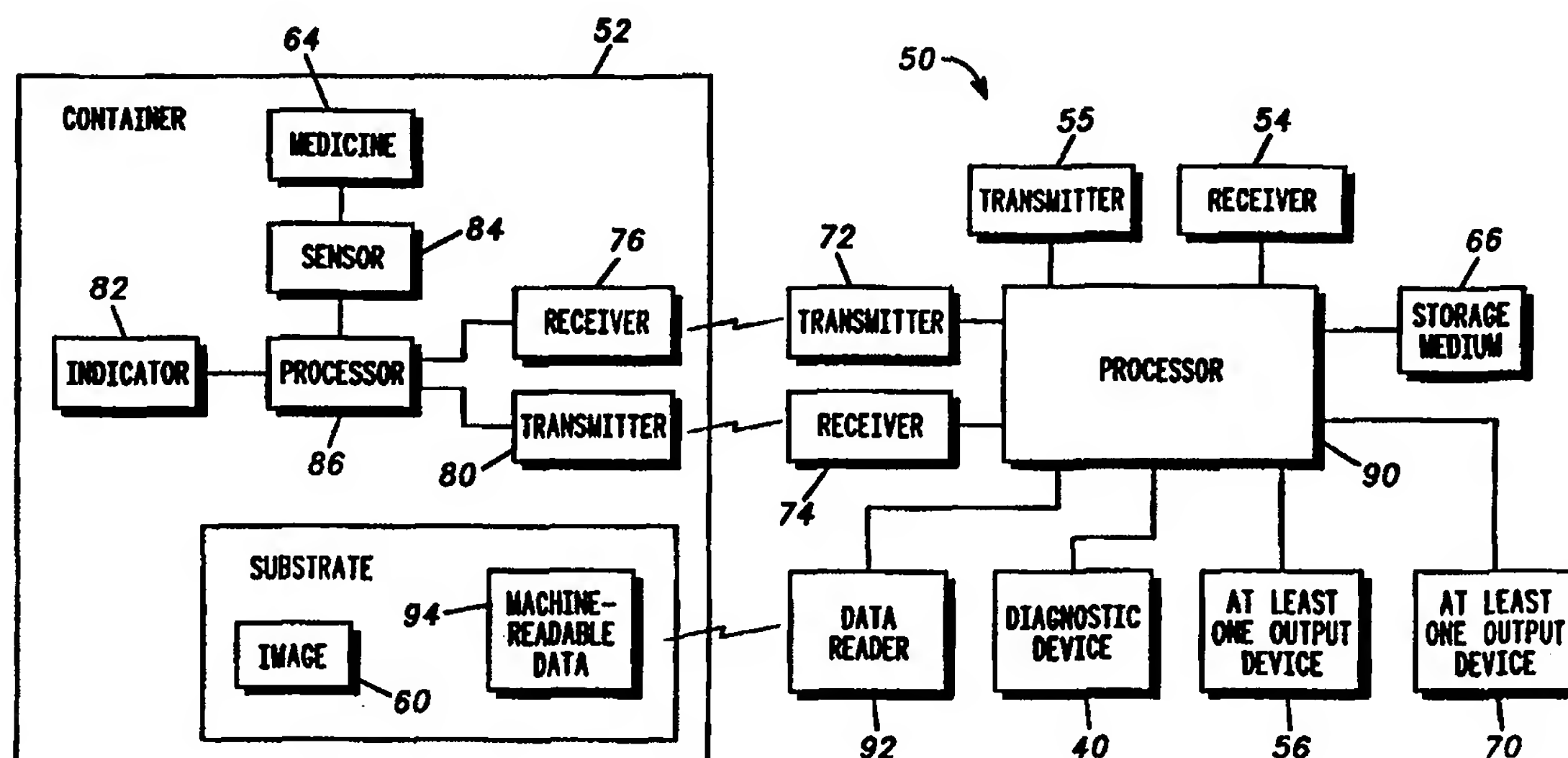




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(54) Title: MEDICAL COMMUNICATION APPARATUS, SYSTEM, AND METHOD



## (57) Abstract

A medical communication apparatus comprises a receiver (54) to receive a message and at least one output device (56) responsive to the receiver (54). The at least one output device (56) generates an alert for taking a first medicine and a second medicine in response to the message, and graphically indicates the first medicine and the second medicine.

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## MEDICAL COMMUNICATION APPARATUS, SYSTEM, AND METHOD

## Technical Field

5           The present invention relates to methods and systems for communicating medical information.

## Background of the Invention

10           Many individuals are required to regularly take multiple types of medicine at multiple times of a day. A number of difficulties are encountered in these situations, both for the individual taking the medicine and for those associated with the welfare of  
15   the individual.

          Some difficulties result from the labeling of medicine containers. For some individuals, prescription labels on medicine containers are difficult to read and/or difficult to understand.  
20   This results from any combination of: (i) a small font size with which prescription labels are printed; (ii) laconic instructions printed on prescription labels; and (iii) unfamiliar words which identify the medicine in a container. Consequently, some individuals  
25   encounter difficulties such as determining the prescribed dosage of the medicine, and determining the times of the day to take the medicine. This can lead to errors in complying with a prescription.

          Other difficulties are witnessed when an  
30   individual attempts to comply with one or more prescriptions. From time to time, the individual can forget to take his/her medicine. Further, the individual may fail to take the entire prescribed dosage. Additionally, the individual may forget where  
35   a medicine container is located. Further difficulties are produced as a result of drug interaction. Here,

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an individual can have an adverse reaction to two or more drugs which, if taken individually, would not occur. The aforementioned difficulties can result in anxiety and stress as an individual attempts to comply  
5 with his/her prescriptions.

#### Brief Description of the Drawings

The invention is pointed out with particularity  
10 in the appended claims. However, other aspects of the invention are described in the following detailed

description in conjunction with the accompanying drawings in which:

FIG. 1 is a block diagram of an embodiment of a medical communication system in accordance with the present invention;

FIG. 2 is a block diagram of an embodiment of a medical communication apparatus and a medicine container in accordance with the present invention;

FIG. 3 is an illustration of an embodiment of a medical communication apparatus which assists an end user in complying with three prescriptions;

FIG. 4 is an illustration an embodiment of a record for the end user which is maintained by the medical database system;

FIG. 5 is a flow chart of an embodiment of a first method performed by the medical database system;

FIG. 6 is a flow chart of an embodiment of a second method performed by the medical database system;

FIG. 7 is a flow chart of an embodiment of a first method performed by the medical communication apparatus;

FIG. 8 is a flow chart of an embodiment of a first method performed by the medicine container;

FIG. 9 is a flow chart of an embodiment of a second method performed by the medicine container;

FIG. 10 is a flow chart of an embodiment of a second method performed by the medical communication apparatus;

FIG. 11 is a flow chart of an embodiment of a third method performed by the medical database system;

FIG. 12 is an illustration of an embodiment of a medical communication apparatus coupled to a diagnostic device; and

FIG. 13 is an illustration of an embodiment of a medical communication apparatus coupled to a data reader.

5 Detailed Description of a Preferred Embodiment

FIG. 1 is a block diagram of an embodiment of a medical communication system in accordance with the present invention. The medical communication system  
10 includes a medical communication apparatus 20 for an end user 22. The medical communication apparatus 20 assists the end user 22 in complying with at least one prescription for taking medicine. The at least one prescription can include a plurality of prescriptions  
15 for a plurality of medicines to be taken at a plurality of times of each day by the end user 22.

The medical communication apparatus 20 communicates with a medical database system 24. The medical database system 24 stores information  
20 associated with the at least one prescription for the end user 22. Examples of the information stored by the medical database system 24 include, but are not limited to, a name of each medicine which the end user 22 is prescribed to take, a dosage of each medicine,  
25 times that each medicine is to be taken, an amount of each medicine which remains in a prescription, and an image or an indicator thereof associated with each medicine.

The medical database system 24 communicates with  
30 the medical communication apparatus 20 to alert the end user 22 of a time to take at least one medicine. The alert can be in the form of an audible indication, a visible indication, or a vibratory indication generated by the medical communication apparatus 20.  
35 In addition, the medical communication apparatus 20

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can indicate which medicine to take, and a corresponding amount of each medicine to take.

Preferably, the medical communication apparatus 20 communicates with at least one medicine container 26 containing the at least one medicine which is to be taken. Here, the medical communication apparatus 20 transmits a signal to the at least one medicine container 26. Selected medicine containers generate an audible indication or a visible indication in response to receiving the signal. The indication is beneficial in aiding the end user 22 to locate selected medicine containers at times when medicine contained therein is to be taken.

After being alerted, the medical communication apparatus 20 communicates a signal to the medical database system 24 to acknowledge that the end user 22 has complied with his/her prescription. If no acknowledgment is received or if an improper acknowledgment is received (e.g. indicating that an improper medicine was taken and/or an improper dosage was taken), the medical database system 24 can either: (i) communicate a subsequent signal to the medical communication apparatus 20 and/or to another communication unit associated with the end user 22; (ii) communicate a signal indicating noncompliance to a communication unit 30 associated with a caregiver of the end user 20; (iii) communicate a signal indicating noncompliance to a communication unit 32 associated with a family member of the end user 20; and/or (iv) communicate a signal indicating noncompliance to a communication unit 34 associated with medical personnel for the end user 20.

Examples of the communication units 30, 32, and 34 include but are not limited to: a telephone; a fax machine; a cellular telephone; a pager; a personal communication services unit; and an electronic network



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access apparatus such as a modem-equipped personal computer, an Internet television, or a network computer. The medical database system 24 can communicate with the communication units 30, 32, and 34 by a telephone call, a fax, a paging message, or an electronic mail message, for example.

Optionally, the at least one medicine container 26 senses an amount of medicine remaining therein, and transmits a signal associated therewith to the medical communication apparatus 20. In turn, the medical communication apparatus 20 communicates a signal associated with the amount of medicine remaining to the medical database system 24. The medical database system 24 communicates with a communication unit 36 associated with a medical supply source, such as a pharmacy, based upon the amount of medicine remaining. For example, the medical database system 24 can communicate a message to a pharmacy when the amount of medicine is at or below a predetermined threshold. This is beneficial for automatic renewal of prescriptions when the amount of medicine is below the predetermined threshold.

The medical database system 24 is populated by communicating with the communication unit 34 of the medical personnel and/or the communication unit 36 associated with the medical supply source. Upon prescribing a medicine, either the medical personnel or a pharmacy can communicate an identifier of the end user 22, the name of the medicine, the dosage, the times for taking the medicine, and an image indicative of the medicine to the medical database system 24.

Optionally, the medical communication apparatus 20 is capable of communicating data with a diagnostic device 40. The diagnostic device 40 monitors a condition of the end user 22 and communicates a signal representative thereof to the medical communication



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apparatus 20. Examples of the diagnostic device 40 include, but are not limited to, a blood glucose meter, a blood pressure monitor, an electronic thermometer, and an electronic scale. The medical communication apparatus 20 communicates the diagnostic data to the medical database system 24. The medical database system 24, in turn, stores information based on the diagnostic data in a record for the end user 22.

10 The medical database system 24 can estimate or maintain a count of an amount of a medical supply for the end user 22. Examples of the medical supply include, but are not limited to, strips for a glucose device, lancets, and needles. The medical database system 24 communicates with the communication unit 36 associated with the medical supply source based upon the amount of the medical supply which remains. For example, the medical database system 24 can communicate a message to the medical supply source 15 when the amount of the medical supply is at or below a predetermined threshold. This is beneficial for automatic reordering of medical supplies for the end user 22.

Preferably, the medical database system 24 includes a computer system having a storage device to maintain a database of records for end user 22 and other end users. The computer system is linked to at least one network such as a paging network, an electronic network, a cable television network, and/or a telephone network to communicate with the medical communication apparatus 20 and the communication units 30, 32, 34 and 36. Preferably, communication is encrypted between the medical database system 24 and each of the medical communication apparatus 20 and the communication units 30, 32, 34, and 36.

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FIG. 2 is a block diagram of an embodiment of a medical communication apparatus 50 and a medicine container 52 in accordance with the present invention. The medical communication apparatus 50 includes a receiver 54 and an optional transmitter 55 to communicate with the medical database system 24. Preferably, the receiver 54 is included in a selective call receiver, such as a wireless pager, to communicate with the medical database system 24 via a paging service. The receiver 54 can be included in a one-way pager (receive-only) or can be included with the transmitter 55 in a two-way pager (receive and transmit). The paging service can utilize a local paging network, a regional paging network, a nationwide paging network, or a global paging network.

It is noted that the receiver 54 and the transmitter 55 can have a variety of other embodiments. For example, the receiver 54 and the transmitter 55 can be included as parts of a modem, a telephone, a cellular telephone, or a network adapter. In general, the receiver 54 and the transmitter 55 communicates with the medical database system 24 by a network such as a telephone network, a computer network, or a cable television network.

The medical communication apparatus 50 further includes at least one output device 56 responsive to the receiver 54. The at least one output device 56 is utilized to alert an end user to take at least one medicine in response to a paging message received by the receiver 54. Examples of the at least one output device 56 include but are not limited to: a display device such as a liquid crystal display to provide a visible alert; an audio output device such as a speaker or a piezoelectric transducer to provide an audible alert; and a vibratory device to provide a vibratory alert.

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Additionally, the at least one output device 56 is utilized to indicate which medicine to take, and how much of each medicine to take. Preferably, the at least one output device 56 includes a display device 5 which displays a graphical representation of each medicine to take. The graphical representation can include an image corresponding to an image 60 associated with the medicine container 52. The image 60 can be supported by a substrate 62 which is affixed 10 to the medicine container 52 or is a part of the medicine container 52. Alternatively, the graphical representation can include an image of medicine 64 within the medicine container 52. Here, for example, the graphical representation can include an image of a 15 pill. If desired, the graphical representation can include a color corresponding to a color associated with the medicine container 52 or the medicine 64.

Regardless of the type of graphical representation, it is preferred that the at least one 20 output device 56 also indicate a dosage of each medicine which is to be taken. The dosage can be indicated numerically by displaying a number with the graphical representation. Alternatively, the dosage can be indicated by displaying a number of like 25 graphical representations. For example, a dosage of two pills can be indicated by displaying two graphical representations for the pill.

The graphical representation and the dosage can be included in the paging message received by the 30 receiver 54. Alternatively, the graphical representation and/or the dosage can be locally stored in a storage medium 66. Here, the paging message can include a designator of a prestored image stored by the storage medium 66.

35 As another alternative, the graphical representation is hardwired into the display device

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56. Here, for example, each of a plurality of predetermined graphical images is patterned into the display device as a respective display element. Each of the predetermined graphical images is independently  
5 activated and deactivated in response to the paging message.

Optionally, the medical communication apparatus 50 further includes at least one input device 70. In response to a user-initiated action received by the at  
10 least one input device 70, the transmitter 55 transmits a signal to acknowledge compliance with the prescription. The signal is communicated to the medical database system 24 via a paging service. Examples of the at least one input device 70 include  
15 but are not limited to one or more buttons, a touchpad, a touchscreen, a pointing device, a trackball, and a mouse.

Optionally, the medical communication apparatus 50 includes a transmitter 72 and a receiver 74 for  
20 communicating signals with a receiver 76 and a transmitter 80 associated with the medicine container 52. In response to the receiver 54 receiving a paging message indicating that the medicine 64 is to be taken, the transmitter 72 transmits a signal for  
25 reception by the receiver 76. An indicator 82 generates an indication, such as an audible indication or a visible indication, in response to the receiver 76 receiving the signal. The indicator 82 can include a display device having a light-emitting display  
30 element or a liquid crystal display element to generate a visible indication, or an audio output device such as a speaker or a buzzer to generate an audible indication.

Alternatively, the transmitter 72 transmits the  
35 signal to the receiver 76 in response to a user-initiated action received by the at least one input

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device 70. Here, for example, the end user 22 can depress a button to initiate an indication to be generated by the indicator 82.

Optionally, a sensor 84 is utilized to sense an amount of the medicine 64 which remains within the medicine container 52. In a preferred embodiment, the sensor 84 includes a transducer which generates a pressure wave in the medicine container 52. The transducer can include a piezoelectric transducer mounted to a cap of the medicine container 52. The amount of the medicine 64 in the medicine container 52 is estimated by sensing how the pressure wave is influenced thereby. For example, the amount of the medicine 64 can be sensed by either: (i) sensing a change in a frequency response exhibited by the piezoelectric transducer or a receiving transducer such as a microphone; or (ii) sensing a change in a transient response exhibited by the piezoelectric transducer or the receiving transducer.

The transmitter 80 transmits a signal based upon the amount of the medicine 64 sensed by the sensor 84. The signal can indicate the amount of the medicine 64 that remains, or can indicate that the amount of the medicine 64 is at or below a predetermined threshold. For example, the signal may be transmitted only if the amount of the medicine 64 is less than that required for a couple of days of use.

The signal from the transmitter 80 is received by the receiver 74. In response to receiving the signal, the transmitter 55 transmits a signal associated with the amount of the medicine 64. The signal is communicated to the medical database system 24 via the paging network. The signal can indicate the amount of the medicine 64 that remains, or can indicate that the amount of the medicine 64 is at or below a predetermined threshold.



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It is preferred that the transmitter 72 and the receiver 76 communicate wirelessly, and that the transmitter 80 and the receiver 74 communicate wirelessly. Wireless communication can be facilitated using radio frequency transmitters and receivers, infrared transmitters and receivers, or ultrasonic transmitters and receivers, for example.

The receiver 76, the transmitter 80, the indicator 82, and the sensor 84 are coupled to a processor 86. The processor 86 directs operations performed by the aforementioned components using one or more electronic components such as a microprocessor, a custom integrated circuit, an application-specific integrated circuit, and/or discrete electronic components.

The receiver 54, the transmitter 55, the at least one output device 56, the storage medium 66, the at least one input device 70, the transmitter 72, and the receiver 74 are coupled to a processor 90. The processor 90 directs operations performed by the aforementioned components using one or more electronic components such as a microprocessor, a custom integrated circuit, an application-specific integrated circuit, and/or discrete electronic components.

Optionally, a data reader 92 is utilized to read machine-readable data 94 supported by the substrate 62. The machine-readable data 94 includes at least one of: data identifying the end user 22; data identifying the medicine 64; data for obtaining information about the medicine 64; data identifying a pharmacy from which the medicine 64 was procured; data for establishing a communication link with the pharmacy; data identifying medical personnel which prescribed the medicine 64; and data for establishing a communication link with the medical personnel.

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The data identifying the end user 22 can include the name of the end user, an identification code, an insurance number, or a Social Security Number, for example. The data identifying the medicine 64 can  
5 include the name of the medicine or an identification code for the medicine 64.

The data for obtaining information about the medicine 64 can include data for linking to a resource in an electronic network. The resource provides  
10 downloadable information about the medicine 64, such as potential side effects and adverse interactions with other drugs. In one embodiment, the resource is provided by the medical database system 24. Here, the data commands the transmitter 55 to communicate a  
15 message to the medical database system 24 via a paging network. Thereafter, the medical database system 24 communicates information about the medicine 64 via a paging message. The information can be displayed using a display device associated with the medical  
20 communication apparatus 50.

In another embodiment, the resource is located on the Internet, the World Wide Web, or an intranet. In these cases, the data includes an electronic address which identifies the resource. The electronic address  
25 can include at least a portion of, or all of, a URL (Uniform Resource Locator) or an IP (Internet Protocol) address, for example.

The data identifying the pharmacy from which the medicine 64 was procured can include the name of the  
30 pharmacy and/or an identification code for the pharmacy.

The data for establishing a communication link with the pharmacy can include a telecommunication number and/or an electronic address for the pharmacy.  
35 Examples of the telecommunication number include, but are not limited to, a telephone number and a pager



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identification number. Examples of the electronic address for linking to the pharmacy include but are not limited to an electronic mail address, a URL, and an IP address.

5           The data identifying the medical personnel that prescribed the medicine 64 can include the name of a doctor, an identification code for the doctor, the name of a medical center such as a hospital, and an identification code for the medical center.

10           The data for establishing a communication link with the medical personnel can include a telecommunication number such as a telephone number or a pager identification number, and/or an electronic address such as an electronic mail address, a URL, or an  
15 IP address.

          Preferably, the machine-readable data 94 is a printed code such as a one-dimensional bar code or a two-dimensional bar code. Examples of one-dimensional bar codes include, but are not limited to, 3 of 9,  
20 UPC-A, Code 128, Codabar, MSI, Extended 3 of 9, Code 93, Extended Code 93, Industrial 2 of 5, Standard 2 of 5, Code 11, and UCC/EAN-128. Examples of two-dimensional bar codes include, but are not limited to, Data Matrix and PDF417. In these embodiments, the  
25 data reader 92 includes an optical reading device such as a bar code reader.

          Alternatively, the machine-readable data 94 is stored in and accessed from a radio frequency tag associated with the medicine container 52. Here, the  
30 data reader 92 includes a tag communicating device.

          As another option, the diagnostic device 40 either is integrated with the medical communication apparatus 50 or is a peripheral of the medical communication apparatus 50. The diagnostic device 40  
35 communicates diagnostic data measured thereby for storage in the storage medium 66 and/or for

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communication to the medical database system 24 via the transmitter 55.

FIG. 3 is an illustration of an embodiment of a medical communication apparatus 100 which assists an end user in complying with three prescriptions. The medical communication apparatus 100 can be embodied by a two-way pager, such as a Tango™ pager by Motorola, Inc.

The three prescriptions include a first medicine contained in a first medicine container 102, a second medicine contained in a second medicine container 104, and a third medicine contained in a third medicine container 106. The first medicine container 102 includes a label 110 which supports machine-readable data 112 and a human-readable image 114 associated with the first medicine. The second medicine container 104 includes a label 116 which supports machine-readable data 120 and a human-readable image 122 associated with the second medicine. The third medicine container 106 includes a label 124 which supports machine-readable data 126 and a human-readable image 130 associated with the third medicine.

For purposes of illustration, the human-readable image 114 includes a heart-shaped icon to indicate to the end user 22 that the first medicine is for a heart condition. The human-readable image 122 includes an icon indicating that the second medicine is for alleviating pain. The human-readable image 130 includes an image of a pill of the third medicine.

At a time when the end user 22 is prescribed to take two pills of the first medicine and one pill of the third medicine, the medical communication apparatus 100 displays two images 132 of the human-readable image 114 and one image 134 of the human-readable image 130. The two images 132 and the one image 134 are displayed by a display device 136 in

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response to a paging message received by the medical communication apparatus 100.

A first display element of the display device can be patterned as one of the two images 132, a second display element can be patterned as another of the two images 132, and a third display element can be patterned as the image 134. Alternatively, each of the two images 132 and the image 134 can be formed by selectively activating a plurality of pixels in an array of display elements.

The medical communication apparatus 100 transmits a first signal for reception by a receiver associated with the first medicine container 102, and a second signal for reception by a receiver associated with the third medicine container 106. The first signal directs an audio output device 140 associated with the first medicine container 102 to generate an audible indication. The second signal directs an audio output device 142 associated with the third medicine container 106 to generate an audible indication. The audible indications assist the end user 22 to determine which medicines to take, and to locate the first medicine container 102 which is remotely located from the second medicine container 104 and the third medicine container 106.

It is noted that an audible indication is not generated by an audio output device 144 associated with the second medicine container 104 since the second medicine is not to be taken at this time. However, the display device 136 is capable of displaying an image corresponding to the human-readable image 122 at another time. The image can be displayed by a plurality of pixels, or by a display element patterned as the human-readable image 122.

The medical communication apparatus 100 includes at least one input device such as a first button 146,

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a second button 148, a third button 150, and a fourth button 152. In general, the at least one input device can include any plurality of buttons.

The end user depresses the first button 146 to  
5 indicate he/she has complied with taking the first  
medicine, and depresses the second button 148 to  
indicate he/she has complied with taking the third  
medicine. In response to depressing the first button  
146 and the second button 148, the medical  
10 communication apparatus 100 communicates an  
acknowledgment signal to the medical database system  
24 via a paging network.

FIG. 4 is an illustration of an embodiment of a  
record for the end user which is maintained by the  
15 medical database system 24. Typically, the medical  
database system 24 maintains a plurality of records  
for a plurality of end users served thereby.

The record includes personal information 160  
about the end user. The personal information 160 can  
20 include the name of the end user, an address of the  
end user, an identification code for the end user,  
and/or an insurance code, for example.

The record further includes at least one  
telecommunication code 162 for contacting the end  
25 user. The at least one telecommunication code 162 can  
include a pager number, a telephone number, a cellular  
telephone number, a PCS number, and/or an electronic  
mail address, for example. Similarly, the record  
includes at least one telecommunication code 164 for a  
30 caregiver of the end user, at least one  
telecommunication code 166 for a family member of the  
end user, at least one telecommunication code 170 for  
medical personnel associated with the end user.

For each medicine prescribed for the end user,  
35 the record includes an identifier 172 of the medicine,  
an image or a designator thereof 174 associated with

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the medicine, a prescribed dosage 176 of the medicine, at least one time 180 at which the medicine is to be taken, an estimated amount 182 of medicine remaining in the prescription, and a compliance history 184 for  
5 taking the medicine. The identifier 172 can include a name of the medicine or an identification code for the medicine. The compliance history 184 can include times at which acknowledgment messages were received, and/or instances of noncompliance, for example. The  
10 estimated amount 182 can be formed with a down counter based upon an initial prescribed amount and the prescribed dosage 176. Alternatively, the estimated amount 182 can be received from the medical communication apparatus 20.

15        Optionally, the record includes a diagnostic history 186 for the end user. The diagnostic history 186 includes a plurality of diagnostic data measured using the diagnostic device 40 and received from the medical communication apparatus 20. The diagnostic  
20 history 186 can include a time and/or a date associated with each of the diagnostic data. In addition, the record can include an identifier 190 and an estimated remaining amount 192 of a medical supply associated with the diagnostic device 40.

25        As another option, the record can include a medical history 194 for the end user. The medical history 194 is received from medical personnel associated with the end user. The medical history 194 can be updated after an examination of the end user by  
30 the medical personnel. The medical history 194 can include results of medical examinations, medical tests, X-rays, and CAT scans, for example.

FIG. 5 is a flow chart of an embodiment of a first method performed by the medical database system  
35 24. As indicated by block 200, the method includes a step of receiving prescription information. The



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prescription information can be communicated from the communication unit 34 associated with medical personnel or the communication unit 36 associated with a pharmacy. The prescription information can be  
5 communicated to the medical database system 24 using a telephone network or a computer network such as the Internet or an intranet, for example. The prescription information can include an identifier of the end user, an identifier of the medicine, an image  
10 or a designator thereof associated with the medicine, a prescribed dosage of the medicine, at least one time at which the medicine is to be taken, an amount of medicine in the prescription, an identifier of the medical personnel, a telecommunication code for the  
15 medical personnel, an identifier of the pharmacy, and a telecommunication code for the pharmacy.

As indicated by block 202, the method includes a step of storing at least a portion of the prescription information in a database. This step can include a  
20 step of creating a record for the end user identified in the prescription if no such record exists. If a record for the end user already exists, the prescription information is stored in the record.

FIG. 6 is a flow chart of an embodiment of a  
25 second method performed by the medical database system. As indicated by block 210, the method includes a step of transmitting a message to alert the end user of a time to take his/her medicine. The message is transmitted at a time based upon the  
30 prescription information stored in a record for the end user. The message is communicated to the medical communication apparatus of the end user using a first telecommunication code stored in the record. The message can include an identifier for each of at least  
35 one medicine, an image or a designator thereof for each medicine, and a dosage for each medicine.

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As indicated by block 212, the method includes a step of determining whether a message indicating compliance with the prescription was received from the medical communication apparatus within a time duration. If the message indicating compliance is received within the time duration, a step of writing data indicative of compliance to the compliance history is performed as indicated by block 214.

If no message indicating compliance is received within the time duration, a step of transmitting at least one subsequent message to the end user is performed as indicated by block 216. This step can include sending a subsequent message to the medical communication apparatus and/or sending a message to the end user using another of the telecommunication codes stored in the record. Using the paging number, a paging message alerting of a time to take medicine can be communicated to the end user's pager. Using the telephone number, the cellular telephone number, and/or the PCS number, an automated voice message or fax message alerting of a time to take medicine can be communicated to the end user. Using the electronic mail address, an e-mail message alerting the end user of a time to take medicine can be communicated to a network access apparatus such as a personal computer.

Additionally, if no message indicating compliance is received within the time duration, a step of transmitting at least one message to another individual can be performed as indicated by block 220. This step can include sending a message to at least one of a caregiver for the end user, a family member of the end user, and the medical personnel using the telecommunication codes stored in the record. The message can include a paging message, an automated voice telephone message, a fax message, or an e-mail



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message indicating noncompliance of the end user with his/her prescription.

As indicated by block 222, the method includes a step of writing data indicative of noncompliance to the compliance history. After performing the step indicated by block 214 or the step indicated by block 222, flow of the method is directed back to block 210 to alert the end user, at a next prescribed time, to take his/her medicine.

FIG. 7 is a flow chart of an embodiment of a first method performed by a medical communication apparatus. As indicated by block 230, the method includes a step of receiving a message generated by the medical database system 24. The message can include an identifier for each medicine, an image or a designator thereof for each medicine, and a dosage for each medicine.

The message is communicated from the medical database system 24 to the medical communication apparatus using a paging service, a telephone network, or a computer network, for example. With reference to FIG. 2, the message is received by the receiver 54.

As indicated by block 232, the method includes a step of generating an alert indication. The alert indication is generated using the at least one output device 56 as directed by the processor 90.

As indicated by block 234, the method includes a step of displaying at least one image indicative of at least one medicine and a respective dosage therefor. The at least one image includes an image corresponding to the image 60 on the medicine container 52 containing the medicine 64 to be taken. The dosage is indicated either by displaying a number with the image or by displaying a number of like images corresponding to a number of pills to be taken.

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The step of displaying is performed using a display device included in the output device 56, and is directed by the processor 90. If a designator of the image is received, the processor 90 retrieves the image from the storage medium 66 using the designator.

As indicated by block 236, the method includes a step of transmitting a signal to the medicine container 52 containing the medicine 64 to be taken. The signal is transmitted by the transmitter 72 as directed by the processor 90. The signal initiates the medicine container 52 to generate an indication for purposes described earlier. The signal can encode an identifier to identify which medicine container is to generate the indication.

As indicated by block 240, the method includes a step of receiving at least one user-initiated action. Each user-initiated action is received by the input device 70 described with reference to FIG. 2 or the buttons described with reference to FIG. 3.

Typically, the at least one user-initiated action indicates that the end user has received the message and/or has complied with his/her prescription.

As indicated by block 242, the method includes a step of transmitting an acknowledgment message to the medical database system 24. The acknowledgment message can be sent in response to receiving the at least one user-initiated action. The acknowledgment message is indicative of reception of the message and/or compliance with the prescription. The acknowledgment message is transmitted using the transmitter 55.

FIG. 8 is a flow chart of an embodiment of a first method performed by a medicine container. As indicated by block 250, the method includes a step of receiving a signal from the medical communication

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apparatus. The signal is received by the receiver 76 described with reference to FIG. 2.

As indicated by block 252, the method includes a step of generating an indication if the signal  
5 identifies the medicine container. The processor 86 determines if the signal identifies the medicine container by comparing an identifier encoded in the signal with an identifier stored locally. The indication is generated by the indicator 82 under the  
10 direction of the processor 86 if the encoded identifier matches the locally-stored identifier.

FIG. 9 is a flow chart of an embodiment of a second method performed by a medicine container. As indicated by block 260, the method includes a step of  
15 sensing or estimating an amount of medicine remaining within the medicine container. The step of sensing the amount of medicine is performed by the sensor 84 and the processor 86 as described with reference to FIG. 2.

20 As indicated by block 262, the method includes a step of transmitting a signal associated with the amount of medicine to the medical communication apparatus 50. The signal is transmitted by the transmitter 80 under the direction of the processor  
25 86. The signal can indicate the amount of medicine that remains, or can indicate that the amount of the medicine is at or below a predetermined threshold.

FIG. 10 is a flow chart of an embodiment of a second method performed by the medical communication  
30 apparatus 50. As indicated by block 270, the method includes a step of receiving a signal associated with an amount of medicine remaining in a medicine container. The signal is received by the receiver 74 described with reference to FIG. 2.

35 As indicated by block 272, the method includes a step of transmitting a message to the medical database

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system 24 based upon the amount of medicine remaining in the medicine container 52. The message is formed by the processor 90 to include an identifier of the end user, an identifier of the medicine, and  
5 optionally the amount of medicine. The processor 90 commands the transmitter 55 to transmit the message to the medical database system 24.

FIG. 11 is a flow chart of an embodiment of a third method performed by the medical database system  
10 24. As indicated by block 280, the method includes a step of receiving a message such as a paging message associated with an amount of medicine that remains in a medicine container. Preferably, the message includes an identifier of the end user, an identifier  
15 of the medicine, and optionally the amount of medicine.

As indicated by block 282, the method includes a step of updating a record in the database upon receiving the message. This step can include updating  
20 the value of the estimated amount 182 of medicine remaining in the prescription as described with reference to FIG. 3.

As indicated by block 284, the method includes a step of sending a message to a pharmacy. The message  
25 can be sent to the communication unit 36 described with reference to FIG. 1. The message indicates either the amount of medicine remaining or that the amount of medicine is at or below a predetermined threshold. The message further identifies the end  
30 user. The pharmacy can utilize this information for automatically renewing selected prescriptions.

FIG. 12 is an illustration of an embodiment of a medical communication apparatus 300 coupled to a diagnostic device 302. The medical communication  
35 apparatus 300 is embodied by a two-way pager such as a Tango™ pager by Motorola, Inc. The two-way pager has

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a user interface 304, a display device 306, and a data port 310. The diagnostic device 302 is illustrated as a blood glucose meter having a display device 312, a user interface 314, a test strip holder 316, a test strip area 320, and a data port 322. The data port 310 is connected to the data port 322 by a cable 324.

The blood glucose meter measures a glucose level from a blood sample applied to a strip inserted into the test strip holder 316. The blood glucose meter communicates a signal associated with the glucose level from the data port 322 to the data port 310 via the cable 324. The two-way pager 300 receives the signal at the data port 310, and communicates a paging message associated with the glucose level to the medical database system 24.

FIG. 13 is an illustration of an embodiment of a medical communication apparatus 330 coupled to a data reader 332. The medical communication apparatus 330 includes a computer 334, a display 336, and input devices including a keyboard 340 and a mouse 342. The computer 334 includes a modem to communicate with an electronic network.

The data reader 332 includes a bar code reader to read at least one bar code 344 supported by a medicine container 346. The end user obtains information from a resource in the electronic network by reading a bar code using the data reader 332. The information is displayed on the display 336 or a printer.

The at least one bar code 344 can encode a variety of information, such as those described with reference to the machine-readable data 94 in FIG. 2. Each type of encoded information can be read to initiate a corresponding series of steps.

In response to reading data identifying the end user from the at least one bar code 344, the medical communication apparatus 330 can download information



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from the end user's record into the medical database system 24.

In response to reading data identifying the medicine in the medicine container 346 or data for obtaining information about the medicine, the medical communication apparatus 330 can download information regarding the medicine. The information can include side effects of the medicine and interactions with other medicines, for example.

10 In response to reading data identifying a pharmacy from which the medicine was procured, the medical communication apparatus 330 can display the name, the address, and the telephone number of the pharmacy.

15 In response to reading data for establishing a communication link to the pharmacy, the medical communication apparatus 330 can either: link to a web page for the pharmacy, initiate a telephone call to the pharmacy, or initiate an e-mail message to the pharmacy.

20 In response to reading data identifying medical personnel which prescribed the medicine, the medical communication apparatus 330 can display the name, the address, and the telephone number of the medical personnel.

In response to reading data for establishing a communication link to the medical personnel, the medical communication apparatus 330 can either: link to a web page for the medical personnel, initiate a telephone call to the medical personnel, or initiate an e-mail message to the medical personnel.

35 It is noted that the medical communication apparatus can include any of the embodiments of a network access apparatus described in the related applications incorporated by reference into this disclosure. Additionally, the machine-readable data

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and/or the substrate can be formed in accordance with any of the embodiments of network navigation devices described in the related applications incorporated by reference. Further, the data reader 332 can include  
5 any of the data readers described in the related applications incorporated by reference. Still further, the medical communication apparatus can link to a resource in an electronic network in accordance with methods and systems described in the related  
10 applications incorporated by reference.

It is noted that, in addition to monitoring compliance to prescriptions, the methods described herein can be modified to monitor compliance in the end user 22 performing medical diagnostic procedures  
15 using the diagnostic device 40. Further, in addition to automatically renewing prescriptions by monitoring an amount of medicine which remains and communicating a message to a pharmacy, the methods described herein can be modified to automatically reorder any medical  
20 supply for the end user 22 by monitoring an amount of the medical supply which remains.

Thus, there has been described herein several embodiments including preferred embodiments of a medical communication system.

25 Because the various embodiments of the present invention utilize a graphical representation associated with a medicine container, they provide a significant improvement in simplifying the identification of the medicine therein.

30 Additionally, the various embodiments of the present invention as herein-described maintain a compliance history so that medical personnel can monitor the end user's compliance with a prescription.

Further, by communicating a message associated  
35 with an amount of medicine which remains in a



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prescription to a pharmacy, the pharmacy can automatically refill selected prescriptions.

It will be apparent to those skilled in the art that the disclosed invention may be modified in  
5 numerous ways and may assume many embodiments other than the preferred form specifically set out and described above.

Accordingly, it is intended by the appended claims to cover all modifications of the invention  
10 which fall within the true spirit and scope of the invention.

What is claimed is:

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## Claims

1. A medical communication apparatus comprising:

- 5 a receiver to receive a message; and  
at least one output device responsive to the receiver, the at least one output device generating an alert for taking a first medicine and a second medicine in response to the message;
- 10 wherein the at least one output device graphically indicates the first medicine and the second medicine.

2. The medical communication apparatus of claim 15 1 wherein the at least one output device includes a display device to graphically indicate the first medicine and the second medicine.

3. The medical communication apparatus of claim 20 1 wherein the at least one output device graphically indicates a dosage of the first medicine and a dosage of the second medicine.

4. The medical communication apparatus of claim 25 1 further comprising:

- at least one input device to receive at least one user-initiated action to acknowledge compliance in taking the first medicine and the second medicine; and  
a transmitter to transmit a message in response  
30 to the user-initiated action.

5. The medical communication apparatus of claim 1 further comprising a transmitter to transmit a signal to a container for the first medicine.

35

6. A medical communication method comprising

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the steps of:

transmitting a first message to a first device to alert a first individual to take at least one medicine;

5       transmitting a second message to a second device if no message from the first device is received within the predetermined time duration.

7.     The medical communication method of claim 17  
10    further comprising a step of writing data indicative of noncompliance of the first individual to a database.

8.     The medical communication method of claim 17  
15    wherein the first message includes a dosage for the at least one medicine.

9.     A medical communication method comprising the steps of:

20       receiving a paging message associated with an amount of medicine remaining in a medicine container; and

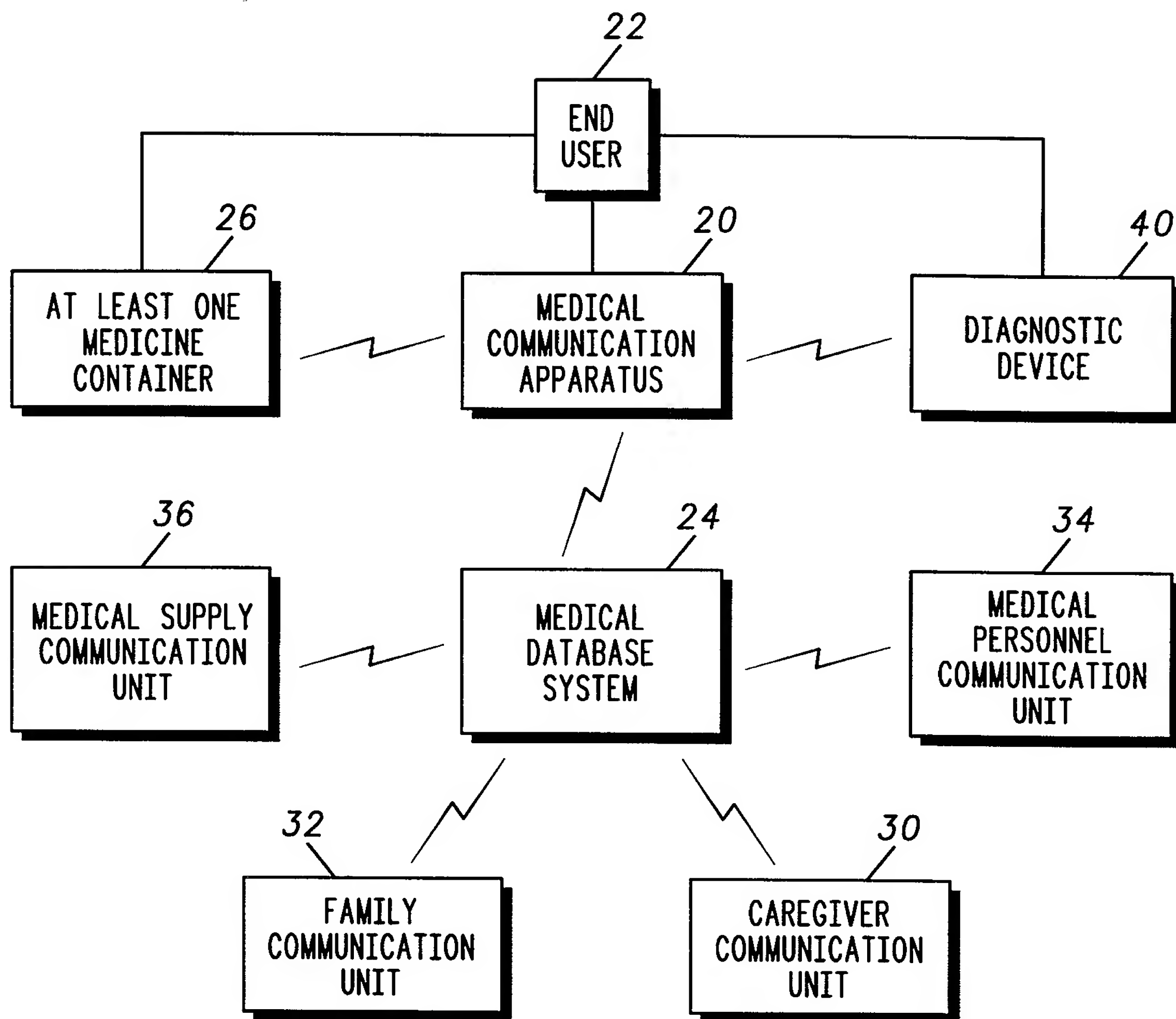
      sending a message to a pharmacy in response to receiving the paging message.

25

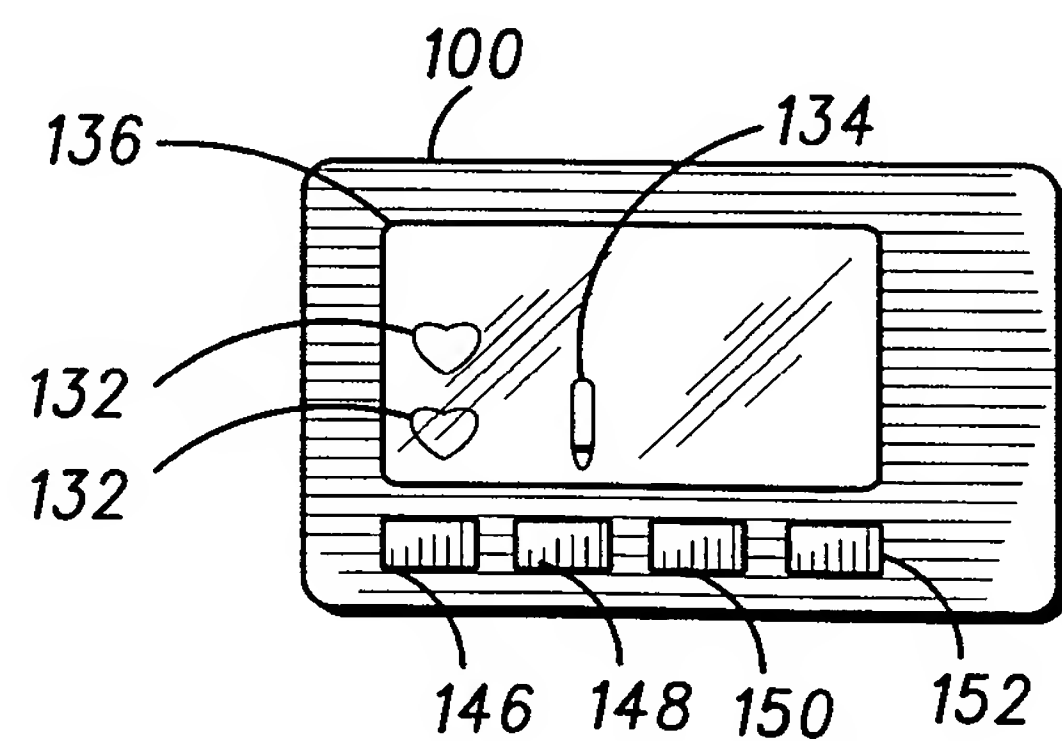
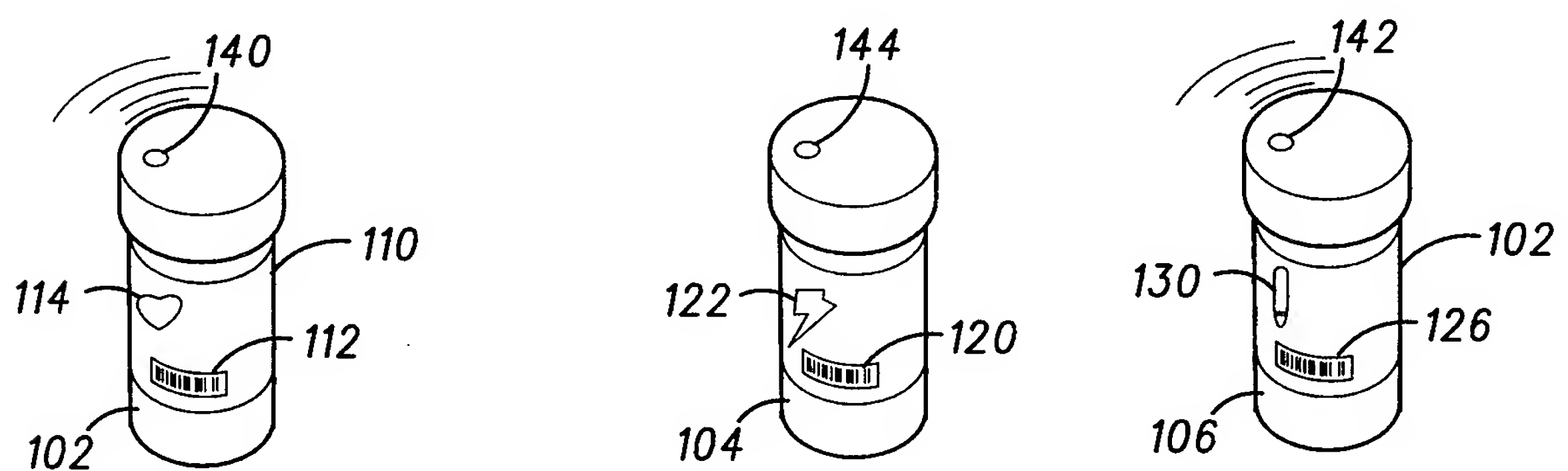
10.    A system comprising:

      a blood glucose meter to measure a glucose level; and

      a two-way pager coupled to the blood glucose  
30    meter to transmit a paging message associated with the glucose level.



***FIG. 1***



*FIG. 3*

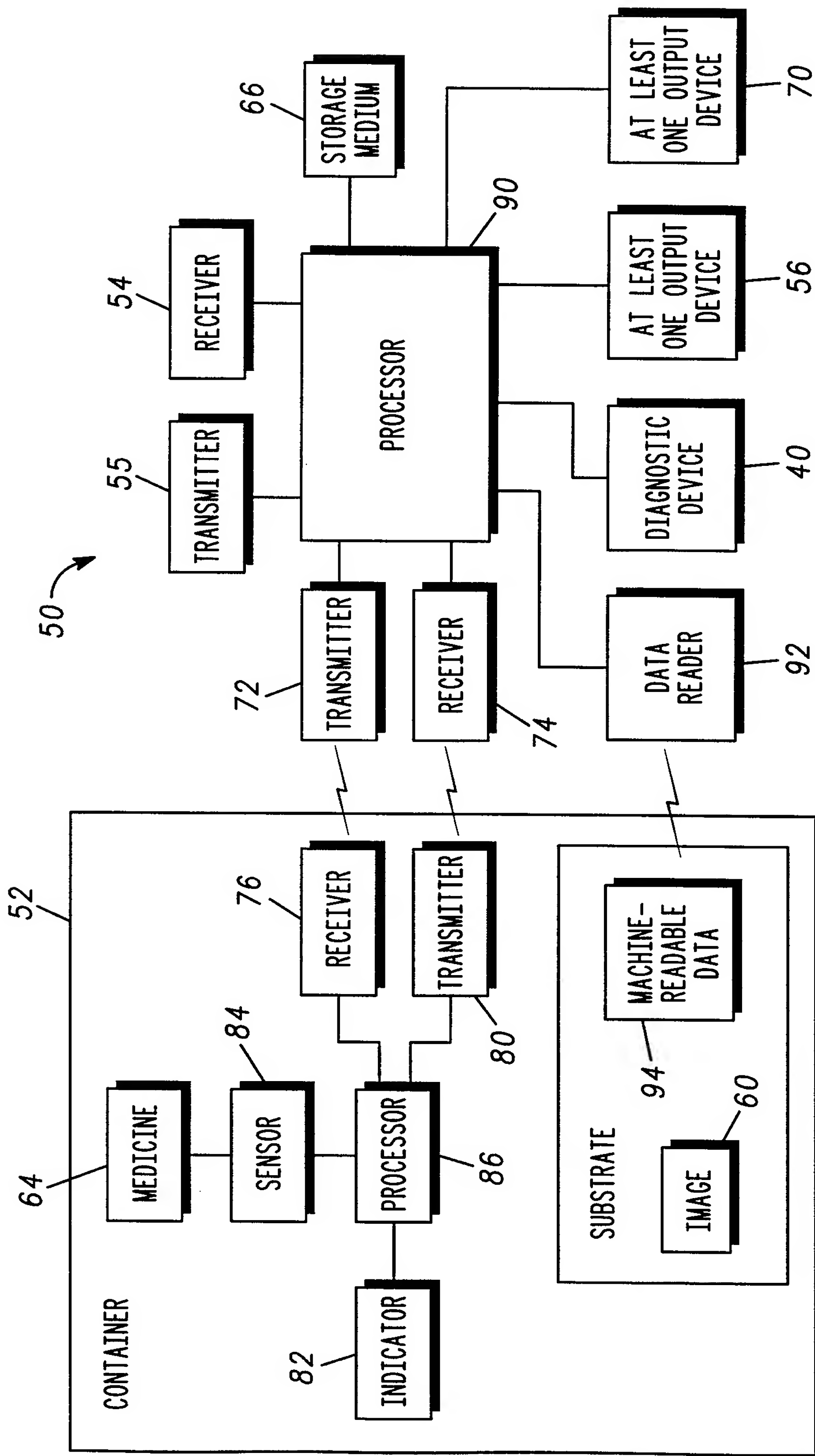


FIG. 2

160	PERSONAL INFORMATION										184	
162	END USER	PAGER #	PHONE #	FAX #	CELLULAR #	PCS #	E-MAIL					
164	CAREGIVER	PAGER #	PHONE #	FAX #	CELLULAR #	PCS #	E-MAIL					
166	FAMILY MEMBER	PAGER #	PHONE #	FAX #	CELLULAR #	PCS #	E-MAIL					
170	MEDICAL PERSONNEL	PAGER #	PHONE #	FAX #	CELLULAR #	PCS #	E-MAIL					
172	IDENTIFIER1	IMAGE1	DOSAGE1	TIME1	TIME2	AMOUNT1	COMPLIANCE HISTORY					
	•	174	176	180	180	182						
	•											
	•											
190	IDENTIFIERn	IMAGEN	DOSAGEN	TIME1	TIME2	AMOUNTn	COMPLIANCE HISTORY				186	
194	IDENTIFIER	AMOUNT	DIAGNOSTIC HISTORY									
	MEDICAL HISTORY											

FIG. 4

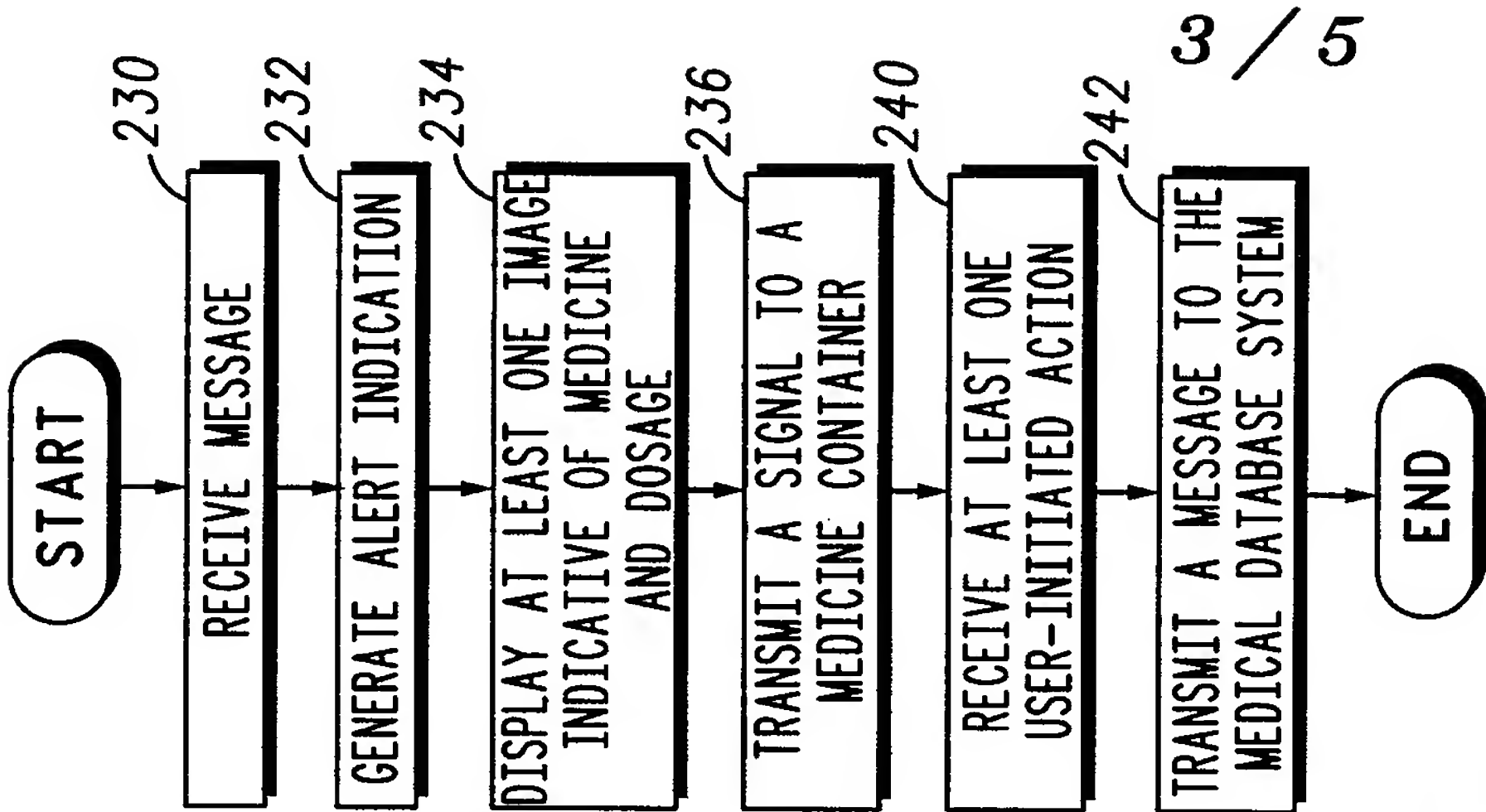


FIG. 7

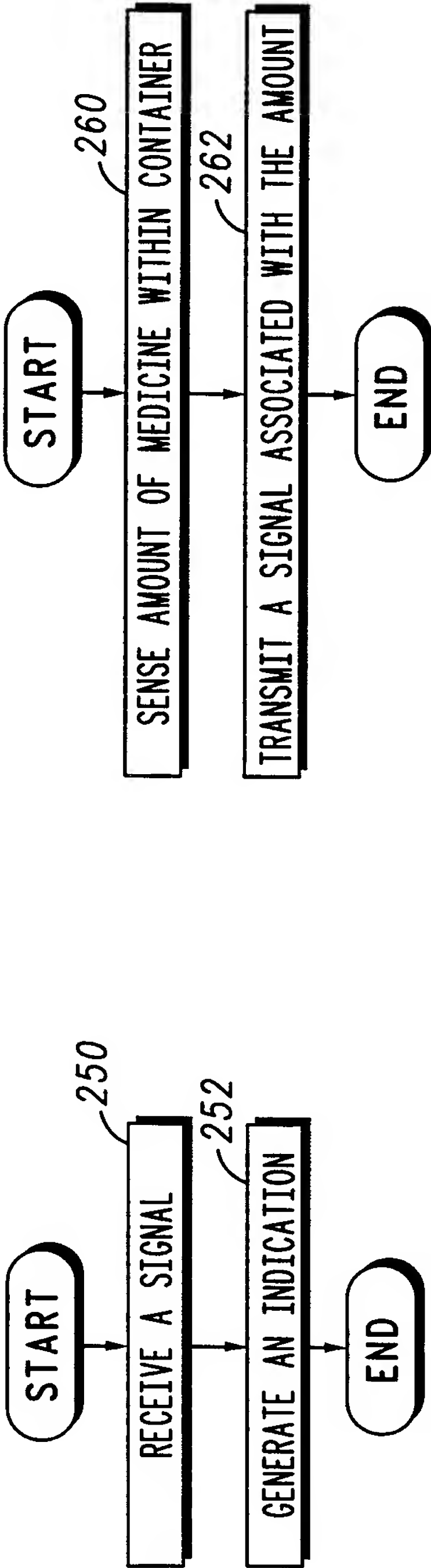


FIG. 8

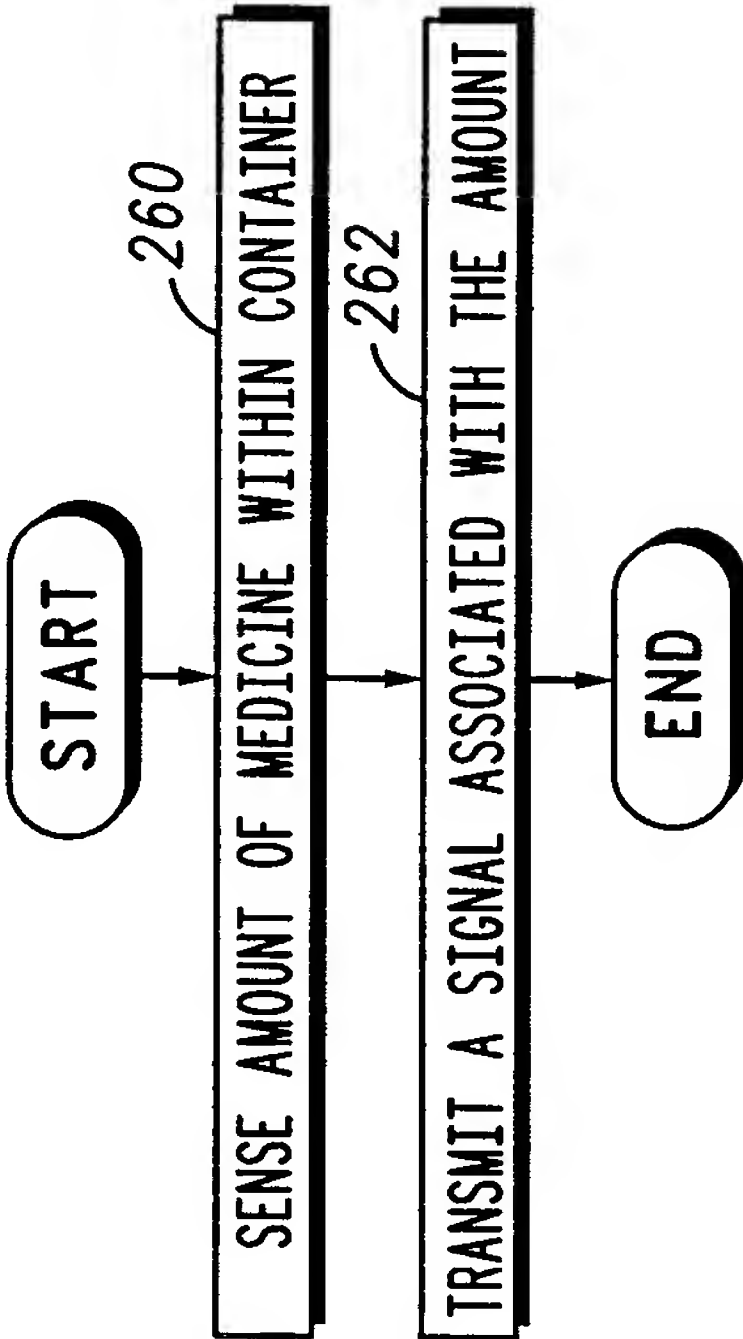


FIG. 9

4/5

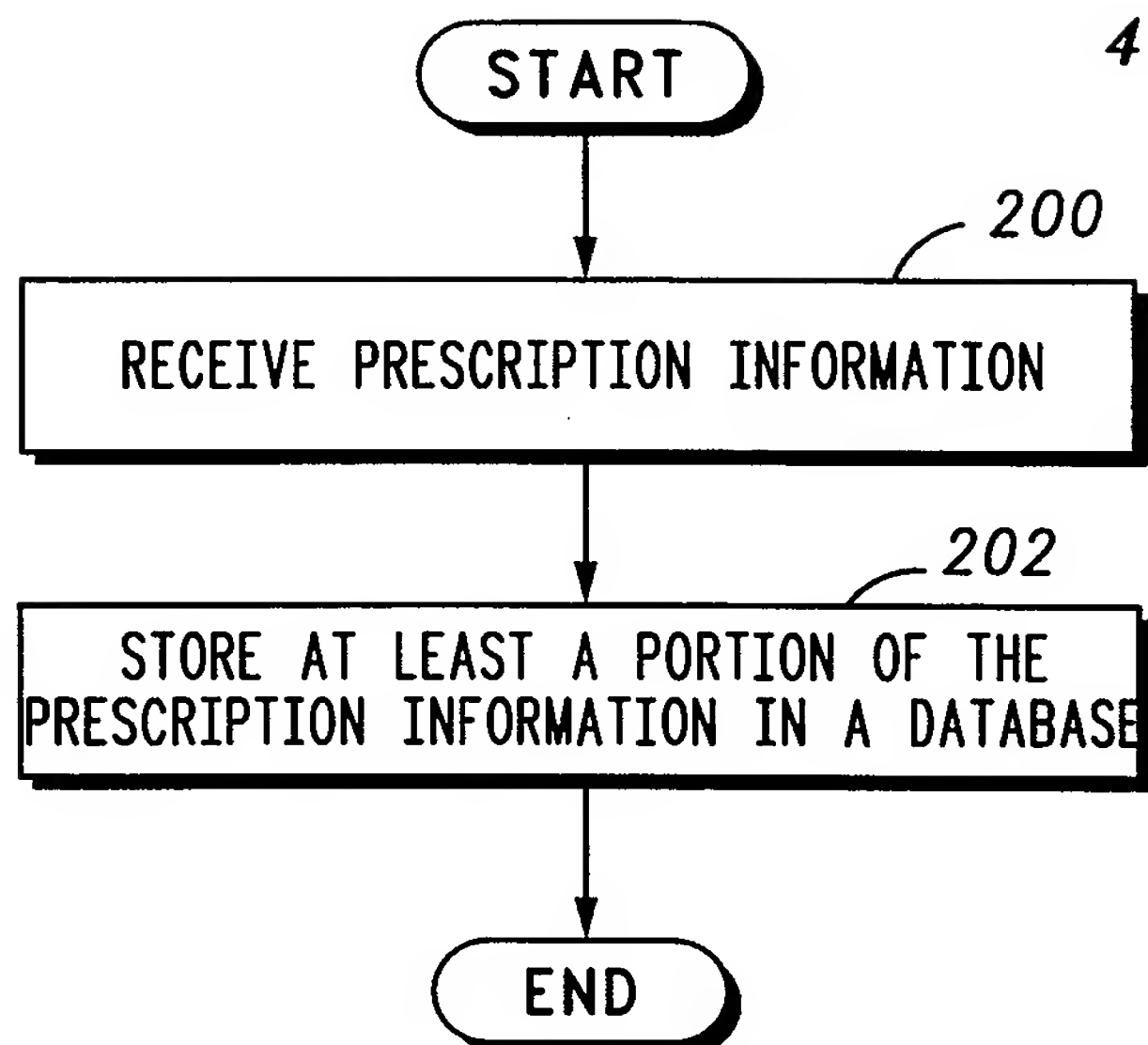
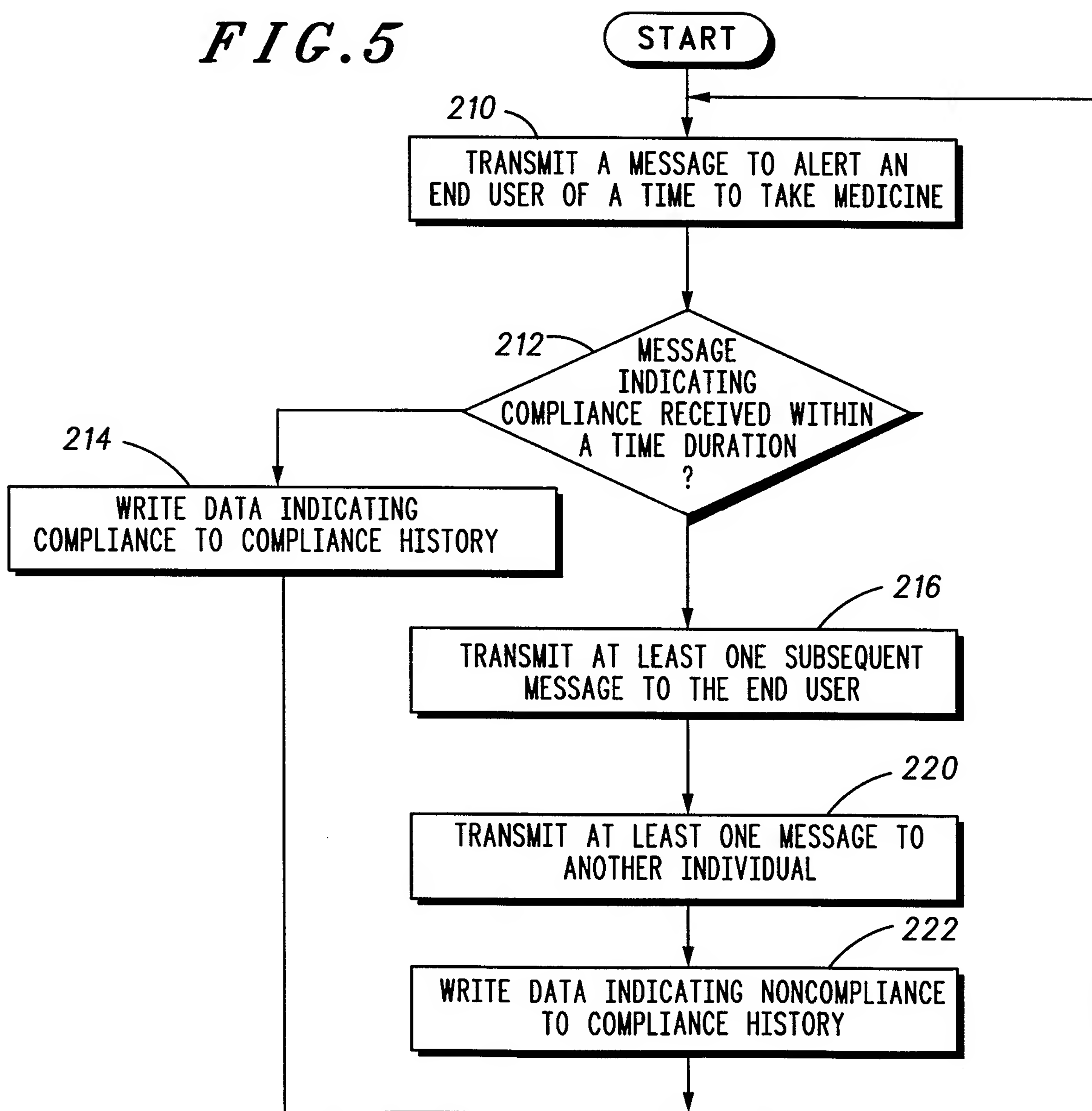
*FIG. 5**FIG. 6*



FIG. 10

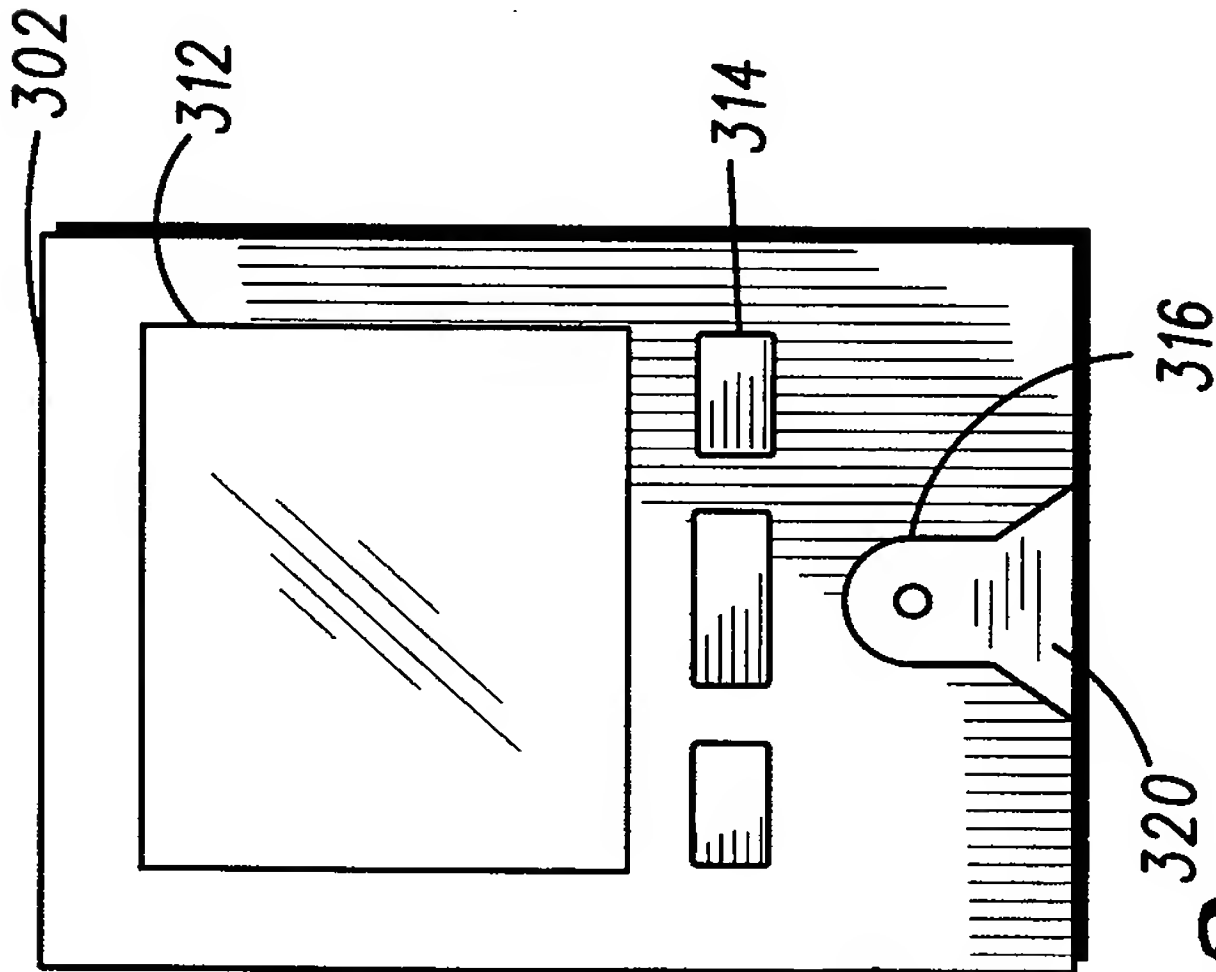
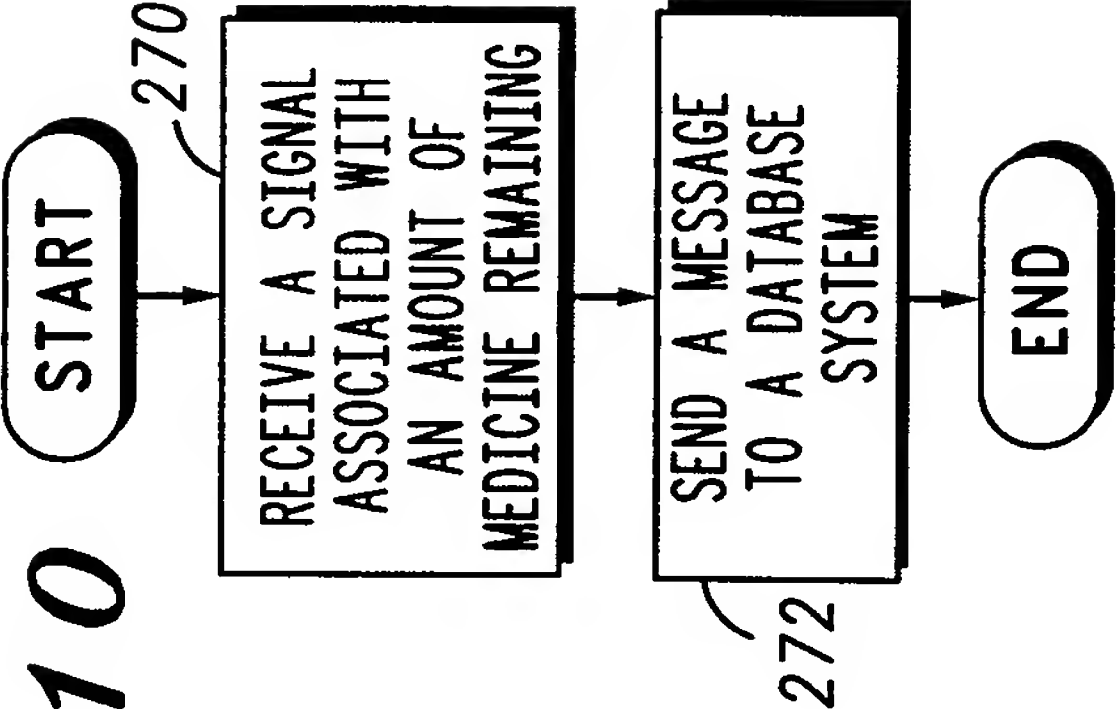


FIG. 12

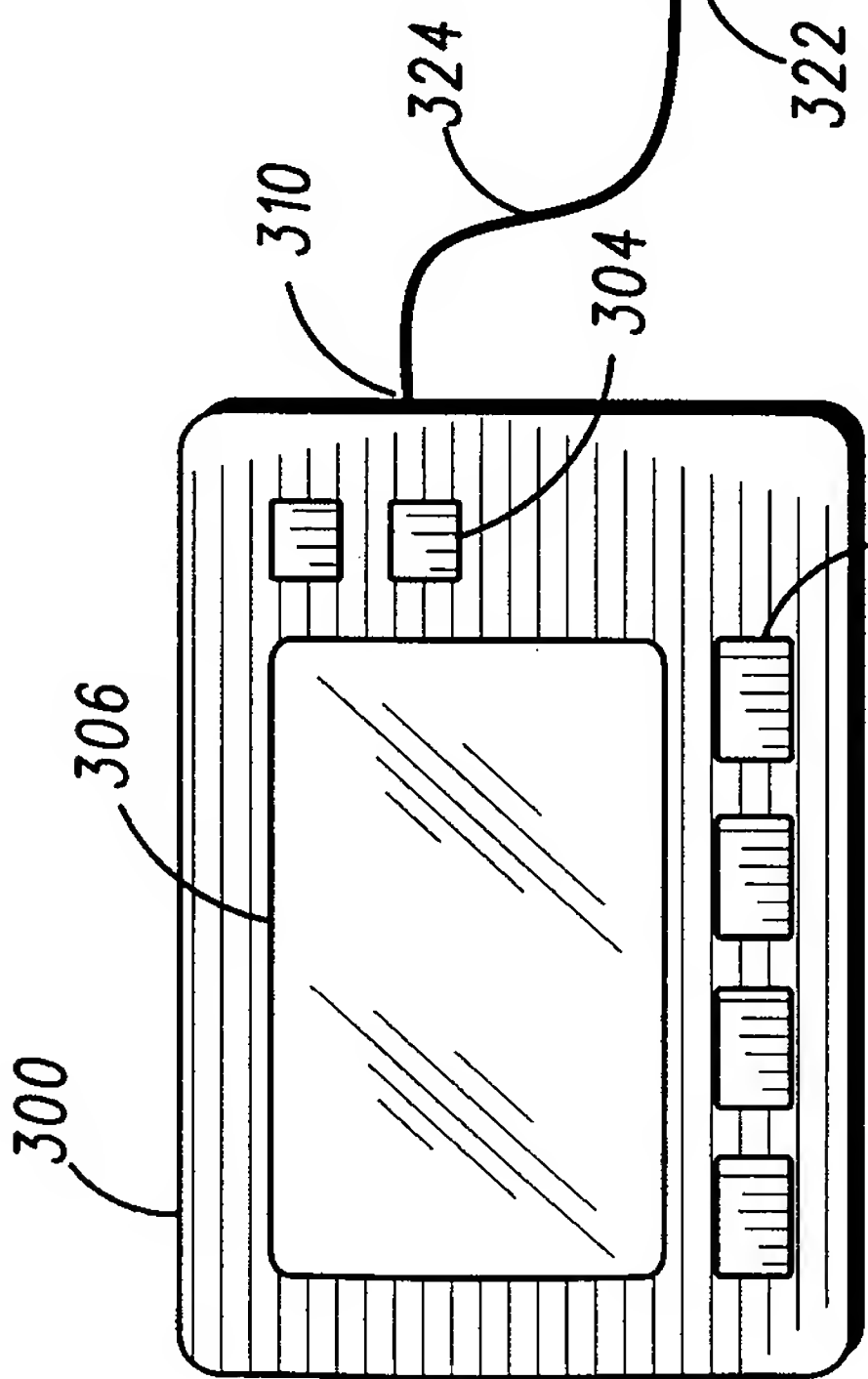


FIG. 11

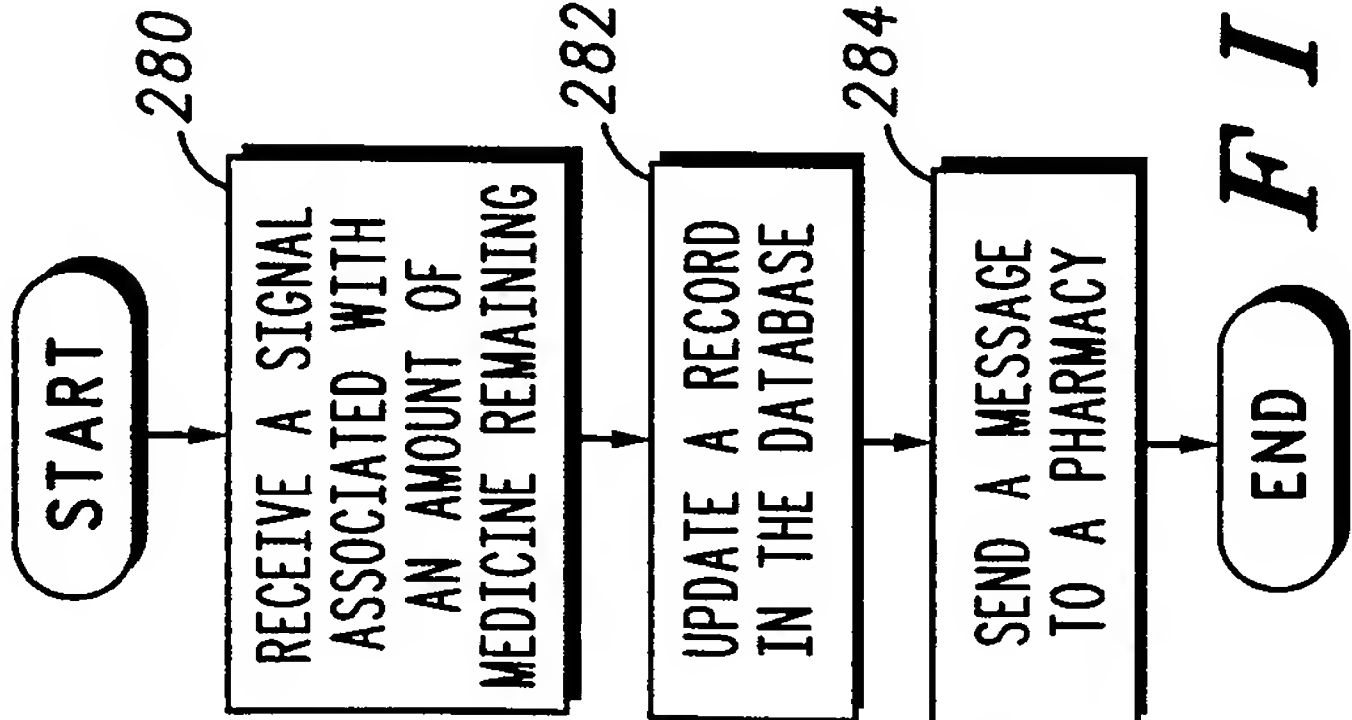


FIG. 11

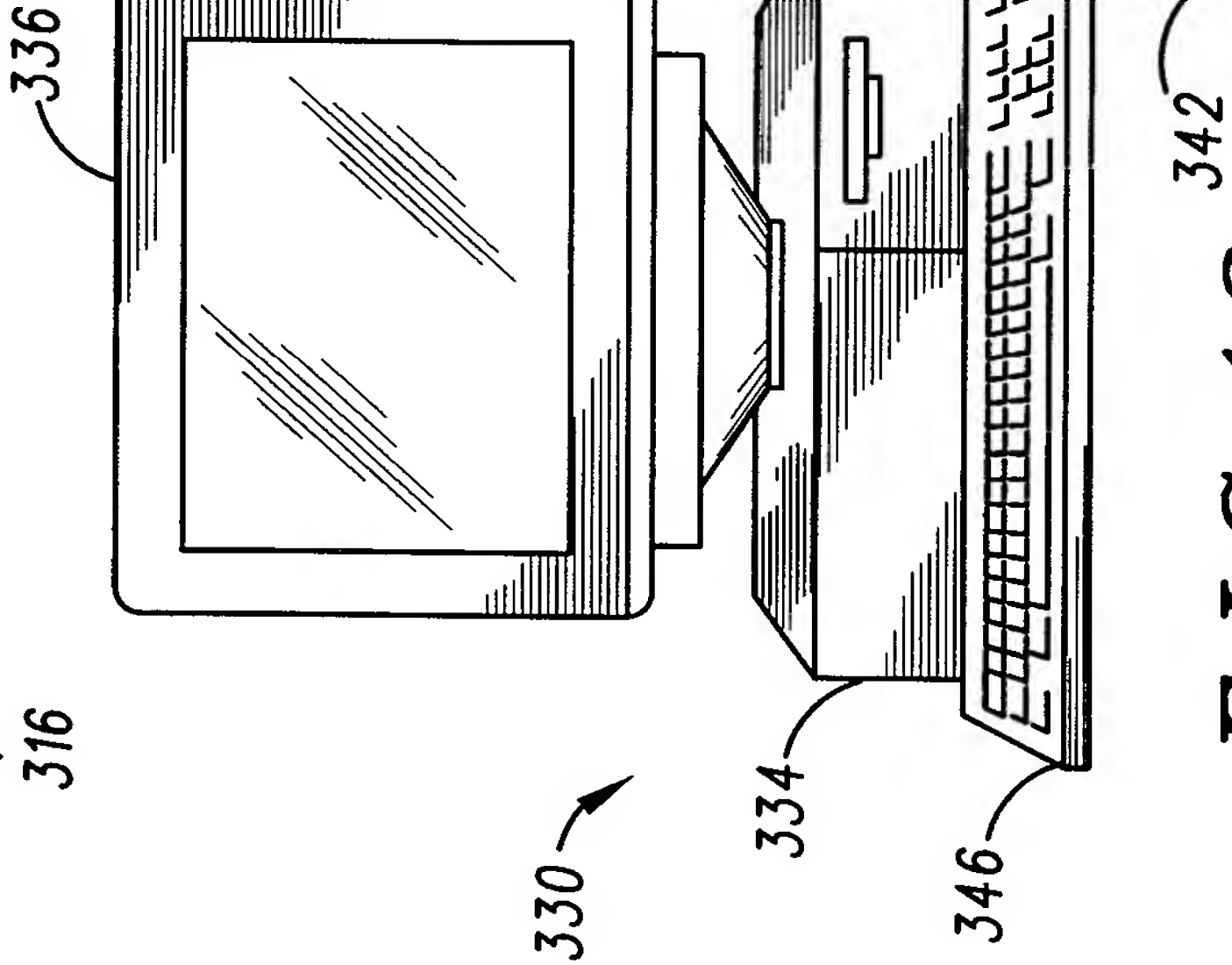


FIG. 13

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US98/04014

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : H04Q 1/30

US CL : 128/897

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 128/897, 903, 904, 920; 340/286.01, 311.1, 825.44, 825.47, 309.15; 455/228, 31.3

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS: search terms pager and medication dosage and compliance

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 5,019,974 A (BECKERS) 28 May 1991, see column 2, lines 28-30, drawing figure 2, and column 4, lines 1-44.	1-4, 6, 8, and 10 ----- 5, 7, and 10
Y, P	US 5,710,551 A (RIDGEWAY) 20 January 1998, See item 44 of drawing figure 2.	5
Y	US 5,390,238 A (KIRK ET AL) 14 February 1995, column 6, lines 1-16.	7
X --- Y	US 4,857,716 A (GOMBRICH ET AL) 15 August 1989, column 17, lines 29-43 and drawing figure 2.	9 ----- 5
Y, P	US 5,623,242 A (DAWSON, JR. ET AL) 22 April 1997, item 160 and 161 of the drawing figures.	10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

12 MAY 1998

Date of mailing of the international search report

18 JUN 1998

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US98/04014

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y, P	US 5,623,242 A (DAWSON, JR. ET AL) 22 April 1997, item 160 and 161 of the drawing figures.	10

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US98/04014

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐

The additional search fees were accompanied by the applicant's protest.

☐

No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

In national application No.  
PCT/US98/04014

## BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

For purposes of this determination it has been assumed that claims 7 and 8 (which depend from nonexistent claim 17) are intended to depend from claim 6.

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claim(s) 1-5, drawn to a medical communication apparatus having the special technical feature of an output device which graphically indicates a first and second medicine. This feature is not found in the other groups.

Group II, claim(s) 6-8, drawn to a medical communication method having the special technical feature of transmitting a second message. This feature is not found in the other groups.

Group III, claim 9, drawn to a medical communication method having the special technical feature of sending a message to a pharmacy. This feature is not found in the other groups.

Group IV, claim 10, drawn to a system having the special technical feature of a blood glucose meter. This feature is not found in the other groups.

The inventions listed as Groups I, II, III, and IV do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Group I, claim(s) 1-5, drawn to a medical communication apparatus having the special technical feature of an output device which graphically indicates a first and second medicine. This feature is not found in the other groups.

Group II, claim(s) 6-8, drawn to a medical communication method having the special technical feature of transmitting a second message. This feature is not found in the other groups.

Group III, claim 9, drawn to a medical communication method having the special technical feature of sending a message to a pharmacy. This feature is not found in the other groups.

Group IV, claim 10, drawn to a system having the special technical feature of a blood glucose meter. This feature is not found in the other groups.

Accordingly, the claims are not so linked by a special technical feature within the meaning of PCT Rule 13.2 so as to form a single inventive concept.